

REMARKS

This Amendment is filed in response to the Final Office Action mailed on July 21, 2006, and is filed herewith a Request for Continuing Examination. All objections and rejections are respectfully traversed.

Claims 1 to 12 and 14 to 44 are currently pending.

Request for Interview

The Applicant respectfully requests a telephonic interview with the Examiner after the Examiner has had an opportunity to consider this Amendment, but before the issuance of the next Office Action. The Applicant may be reached at 617-951-3067.

Claim Rejections – 35 USC § 102

At page 4 of the Office Action, claims 1-5, 22, 23 and 31-33 were rejected under 35 U.S.C. §102 as being anticipated by Patterson et al, "A case for Redundant Arrays of Inexpensive Disks (RAID), June 1988, hereinafter Patterson.

The present invention, as set forth in representative claim 1, comprises in part:

1. A system adapted to distribute redundant information across disks of an array, the system comprising:
 - a storage operating system configured to invoke storage operations executed by a storage system, the storage operating system further configured to manage storage of information, including the redundant information and data, on blocks of the disks in response to disk access operations, the storage operating system including a storage module adapted to compute the redundant information in response to placement of the data in

stripes across the disks, *the storage operating system maintaining at least one unallocated block per stripe for use by the storage module to store the computed redundant information, wherein the at least one unallocated block used to store the redundant information is located in any disk and wherein the location of the at least one unallocated block use to store the redundant information is dynamically allocated by the storage module before each write request for each stripe.*

By way of background, Patterson describes a fifth level RAID system. RAID level 5 assigns parity in a fixed pattern across the disks usually a rotating pattern. One problem with RAID 5 is that it is hard to add new disks because of the fixed parity placement.

Applicant respectfully urges that Patterson does not describe Applicant's claimed novel *the storage operating system maintaining at least one unallocated block per stripe for use by the storage module to store the computed redundant information, wherein the at least one unallocated block used to store the redundant information is located in any disk and wherein the location of the at least one unallocated block use to store the redundant information is dynamically allocated by the storage module before each write request for each stripe.* In further detail, Applicant's invention allows *the at least one unallocated block use to store the redundant information is dynamically allocated by the storage module before each write request for each stripe.* Before each stripe is written across each disk, the storage module determines at least one unallocated block to use for redundant information. Each unallocated block is selected from the one or more blocks that are not already allocated to data blocks. The storage operating system then selects at least one unallocated block of the stripe to store redundant informa-

tion. This allows for the redundant information to be placed in any order, varying from stripe to stripe. Additionally, dynamically allocating the redundant information allows for a new disk to be added and with a next stripe be protected with redundant information. In sharp contrast, Patterson describes a RAID 5 system where parity information is stored in a rotating pattern across the disks changing after each stripe. There is no disclosure in Patterson of determining an unallocated block after data blocks are allocated and storing parity information in that block because Patterson selects the parity block first on a rotating basis through all disks, then stores the data blocks in the remaining blocks.

Accordingly, Applicant respectfully urges that Patterson is legally insufficient to anticipate the present claims under 35 U.S.C. §102 because of the absence of the Applicant's claimed novel *the storage operating system maintaining at least one unallocated block per stripe for use by the storage module to store the computed redundant information, wherein the at least one unallocated block used to store the redundant information is located in any disk and wherein the location of the at least one unallocated block use to store the redundant information is dynamically allocated by the storage module before each write request for each stripe.*

At page 2 of the Office Action, claims 36-39, 42, and 44 were rejected under 35 U.S.C. §102, as being anticipated by Spiegel et al., US Patent No. 6,571,326, issued on May 27, 2003, hereinafter Spiegel.

The present invention, as set forth in representative claim 36, comprises in part:

36. A method for distributing redundant information across disks of an array with a plurality of blocks on each disk, comprising:
determining which blocks are unallocated in a stripe across the disks;
reserving unallocated blocks for storing the redundant information in one or more reserved unallocated blocks;
arranging data in the stripe for the data to be stored in one or more allocated blocks across the disks of the array;
assigning the redundant information to the one or more reserved unallocated blocks; and
writing the data in the allocated blocks and the redundant information in the one or more reserved unallocated blocks as the stripe across the disks of the array.

By way of background, Spiegel discloses a machine readable medium to pre-allocate space for data. In particular a nonvolatile manager determines the amount of unallocated space on a nonvolatile memory. Then, a dry run reservation tracker is designed to copy contents of a logical block table buffer into a dry run buffer. If there is not sufficient unallocated blocks for the contents of the logical block table buffer, the request is modified. If there is sufficient unallocated blocks for the contents of the logical block table buffer, then the reservation tracker reserves the unallocated blocks for the logical table buffer. The system is used to determine the most efficient use of unallocated space for placing data in the nonvolatile memory. (Col. 5, lines 29-31).

Applicant respectfully urges that Spiegel does not disclose nor suggest Applicant's claimed novel ***writing the data in the allocated blocks and the redundant information in the one or more reserved unallocated blocks as the stripe across the disks of the array.*** In further detail, Applicant's claimed invention is writing both data and redundant information to the stripe, where the data is first allocated to the blocks of the

stripe. Then, the system determines which blocks in the stripe are not being used by data. One or more of the blocks unallocated for data are then reserved for redundant information, i.e., parity blocks. There is no disclosure in Spiegel of *writing ... redundant information in the one or more reserved unallocated blocks* for each stripe written across the array of disks, as claimed by Applicant. Spiegel merely discloses determining unallocated space in a memory for storing data. There is no mention of redundant information or of striping across multiple disks.

Accordingly, Applicant respectfully urges that Spiegel is legally insufficient to anticipate the present claims under 35 U.S.C. §102 because of the absence of the Applicant's claimed novel *writing the data in the allocated blocks and the redundant information in the one or more reserved unallocated blocks as the stripe across the disks of the array*

Claim Rejections – 35 USC § 103

At page 6 of the first Office Action, claims 6-8, 11, 12, and 26 were rejected under 35 U.S.C. §103 as being unpatentable over Patterson, in view of Baylor et al, US Patent No. 5,862,158, hereinafter Baylor.

At page 9 of the first Office Action, claims 14, 15, 18-20, and 27 were rejected under 35 U.S.C. §103 as being unpatentable over Patterson, in view of Baylor, and in further view of Stallmo et al., US Patent No. 5,657,468, hereinafter Stallmo.

At page 12 of the first Office Action, claims 9 and 10 were rejected under 35 U.S.C. §103 as being unpatentable over Patterson, in view of Baylor, and in further view of Ulrich, US Patent Application publication No. 2002/0124137, hereinafter Ulrich.

At page 2 of this Office Action, claims 16, 17, 21, 34, 35 were rejected under 35 U.S.C. §103 as being unpatentable over Patterson, in view of Baylor, and in further view of Stallmo, and in further view of Wiencko et al., US Patent No. 6,557,123, hereinafter Wiencko.

At page 4 of this Office Action, claims 37, 38, 40, 41, and 43 were rejected under 35 U.S.C. §103 as being unpatentable over Spiegel, in view of Patterson.

Applicant respectfully notes that claims 6-12, 14-21, 26, 27, 34, 35, 37, 38, 40, 41, and 43 are dependent claims that depend from independent claims believed to be in condition for allowance. Accordingly, claims 6-12, 14-21, 26, 27, 34, 35, 37, 38, 40, 41, and 43 are believed to be in condition for allowance.

All independent claims are believed to be in condition for allowance.

All dependent claims are believed to depend from allowable independent claims.

The Applicant respectfully solicits favorable action.

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No. 03-1237.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Shannen C. Delaney', written over a horizontal line.

Shannen C. Delaney

Reg. No. 51,605

CESARI AND MCKENNA, LLP

88 Black Falcon Avenue

Boston, MA 02210-2414

(617) 951-2500